

d'expérience" and his pot cultures to demonstrating the effect of nitrogen, phosphoric acid, potash, &c. Whatever happens to this sort of teaching in England, we hope the primary school will be left uninvaded by theories of manuring. Practical farmers have sometimes denounced the whole race of agricultural teachers as advertising agents for the artificial manure makers, and if when they happen to visit the village school, they hear little lads of twelve and thirteen glibly reciting scraps about nitrates, kainit and the like, there will only be one strong prejudice the more against "education."

All the programmes set out by Mr. Brereton and Mr. Medd are based too much on chemistry, which in an elementary school is necessarily academic instruction, and too little on botany and zoology, which can be made real, and interwoven with the child's daily experience of field and garden. Nor is there any indication of work done by the children themselves; the instruction seems wholly didactic.

But after all a syllabus should only be regarded as a series of boundary walls; it should say, "do what you like within these limits, but don't think yourself called upon to do it all." It does harm when it becomes a stereotyped substitute for the teacher's judgment. On the teacher the whole thing depends, and this is thoroughly recognised in both reports. It is because the current generation of teachers is not prepared for the work, either in England or France, that the work of vitalising the instruction of the village school must proceed slowly. France has the advantage of a properly organised system of training colleges through which all their teachers pass, and in them a course of agriculture is given by the departmental professor. In Mr. Brereton's opinion he has so many more pressing duties that this part of his work is performed in a somewhat perfunctory fashion; the teaching is too academic, and not enough use is made of the garden for practical instruction. It is difficult to see the value of "a lot of hard digging" for students when the gardener is left with the more ticklish operations that follow. We do not gather that the training colleges have arrived at any conception of a "normal" course in these studies bearing on agriculture and horticulture, which would practice the teacher in the very experiments, indoors and out, that he will want to pass on to his scholars. No one is in more need of this kind of drilling, for the primary teacher's training is always disposing him to think that if he knows how to describe an experiment he knows how to do it. Mr. Medd found a teacher who was afraid to do experiments lest his boys should meet with accidents and he himself be involved in claims for compensation; and Mr. Brereton records how unsuccessful the manure experiments, either in the open or in plots, were apt to be, which indeed is only "pretty Fanny's way."

However it is clear that the crux of the whole problem, lies with the teacher. Turn him out with an adequate preparation, keep him encouraged on the right lines by the inspectorate, and let him work out his own salvation. Uniformity is the least of virtues in this matter; the spirit the teacher puts into the task alone tells, and his individuality ought to be reflected in the instruction he gives, until each school has a special character of its own.

We trust these reports will be widely circulated and widely read; they will show what can be done, and may save us from expecting too rapid a progress. Mr. Medd speaks, perhaps, with more knowledge of country life, more experience of the same kind of thing at home, even if his enthusiasm does lead him to see things rather as they are meant to be than as they are. Mr. Brereton has the keener pedagogic eye for the place where the organisation becomes paper only. But both reports are eminently readable. Mr. Brereton is not afraid of letting his own personality appear, and if the final homilies which he addresses to the farmer, parson and squire sug-

gest that Mr. Brereton is young, and knows the country chiefly *en bicyclette*, those poor sinners are too chastened already to take his advice otherwise than with a smile.

A. D. H.

THE SMITHSONIAN INSTITUTION: ITS DOCUMENTARY HISTORY.¹

THE Smithsonian Institution, the great scientific establishment at Washington, which, in many respects, is to the United States of America what the Royal Society is to this country, was founded under the will of James Smithson (b. 1765), a son of Hugh Smithson, afterwards Duke of Northumberland, by Elizabeth Macie, a cousin of the Percys. The story of how it came to be founded, and of its great work for the United States and for the world, has been more than once recounted in this Journal. An article contributed by the late Dr. G. Brown Goode (*NATURE*, vol. liii. pp. 257, 281) in January, 1896, contained a very full account of the origin of the Institution and of the system of its administration; and, when the same writer edited, under the auspices of the Institution itself, a work on the "History of its First Half-Century," we took occasion in reviewing it to give a comprehensive outline of the rise and progress of this great centre of scientific energy (*NATURE*, vol. lviii. p. 271).

The work at present under review does not perform the same function as that of Dr. Goode. It is not a history of the Smithsonian Institution, but, as the title-page declares, it is a collection of "documents relative to its origin and history." In fact, it brings down to date a volume with the same title which was published in 1879. In the latter volume the documents relative to the inception and organisation of "the Smithsonian" from 1835 to 1837 were printed, and the present volumes cover the whole period from 1835 to 1899.

In compiling and editing these documents, Mr. William Jones Rhees, the keeper of the archives of the Smithsonian Institution, has very admirably performed a most arduous task. A compiler is not called upon to produce a work of high literary art, but he is called upon to give with faithfulness and accuracy all that comes strictly within the scope of his compilation, and this Mr. Rhees appears to have done. He has given us two classes of documents: first, the will of James Smithson, with correspondence, &c., relative to the bequest, and, secondly, a full reprint of those congressional proceedings which contain legislation relative to the establishment of the Smithsonian Institution. The extraordinary minuteness of the information preserved in these documents, especially of the first class, is sometimes almost amusing. Not only have we the will of James Smithson and the documents in the Chancery suit brought by the U.S. Government against the British Government, but we have the lawyers' bill for costs of the suit and the full account of the expenses of Richard Rush, who came over to fetch the money. We not only have a list of the stocks transferred by decree of the High Court of Chancery and a schedule of the personal effects of James Smithson, but we have all the details of Smithson's tea-service—12 cups and saucers, 6 coffee cups, teapot, slop basin, sugar basin and lid, &c. Indeed, such a mass of material, important and unimportant, as is printed in these two volumes would be overwhelming were it not accompanied by a good index. But this, by the editor's care, has been given, and those who have had experience of biographical or historical authorship and who have sighed over the lack of particulars which so often belongs to the early stages of a history will not quarrel with a minuteness of detail

¹ "The Smithsonian Institution: Documents relative to its Origin and History, 1835-1899." Compiled and edited by William Jones Rhees. 2 vols. (Pp. liii. + 1044 and xvi. + 1045 to 1983.) (Washington, 1901.)

which is thus made readily available. Mr. Rhee's volumes will doubtless become for the future historian a storehouse of information great and small, and for the official a book of reference of permanent value.

In the voluminous reports of congressional proceedings which are here reprinted, many things will be found which are of special interest to English readers. There are numerous allusions to our own institutions, such as the Royal Society and the British Museum. Among other matters of the kind we note, in the proceedings of the thirty-third congress (1853-55), a letter of Prof. Agassiz, in which he mentions that Smithson's magnificent bequest of 105,000*l.* sterling was originally intended for our own Royal Society, but that certain scientific papers which that gentleman offered for publication in the *Philosophical Transactions* were declined, "upon which he changed his will and made his bequest to the United States." One can scarcely, however, grudge the loss to our own country in view of the liberal spirit and the enlightened policy which have always ruled the affairs of "the Smithsonian," and have done so much to advance the cause of science.

That policy has not been maintained without many a struggle. It took, to begin with, eight years to decide what form the establishment for "increase and diffusion of knowledge" was to take. Schemes for "a library, a botanical garden, an observatory, a chemical laboratory, a popular publishing house, a lecture lyceum, an art museum," all fought together and killed each other, and when this consummation was reached and the Smithsonian Institution was erected upon the battlefield, the ghosts of two at least of the old schemes—the library and the college—continued to haunt the proceedings of congress and cause endless trouble. It was in the course of one of these after-battles—a battle with those who desired to divert the funds of the Institution from scientific work to the foundation of a great library—that a letter from Prof. Benjamin Peirce was read which makes honourable mention of the scientific work both of the foundation and the founder, an extract from which may serve as an appropriate conclusion to this notice:—

"The valuable contributions to knowledge which have already been made by the Smithsonian Institution are a living proof that vast libraries are not necessary to the development of new thoughts. If you will compare these memoirs with the scientific productions of the same period in Europe you may find them, perchance, inferior in erudition, but not in profoundness and originality of thought. Do you believe that Smithson, who was himself engaged in chemical investigations, could have intended a library by his words 'an institution for the increase and diffusion of knowledge among men'? If you will examine his nine memoirs to the Royal Society, of which he was an active member, and his eighteen other contributions to science, you will not find one of them which required a library for its production. Each was the natural growth of a deeply thinking mind. Smithson was emphatically a maker, not a collector of books; and, in the scientific circle to which he belonged, the ordinary use of language would have totally precluded the interpretation which some men of quite a different cast of mind have presumed to impose upon his words" (p. 557).

H. R.

ARCTIC MAGNETIC OBSERVATIONS.

A SYSTEMATIC series of observations on terrestrial magnetism, atmospheric electricity and aurora was commenced by Prof. Birkeland and his assistants in 1899-1900, and a report upon some of the results was published last year.¹ The first observations were made at

¹ "Expédition Norvégienne de 1899-1900 pour l'étude des aurores boréales. Résultats des recherches magnétiques." Par Kr. Birkeland. Pp. 80; with 12 plates. (Christiania, 1901.)

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Bossekop (Finmarken), in the north of Norway. For magnetic observation, self-recording photographic apparatus was employed of the Eschenhagen pattern, the drums carrying the paper being capable of rotation at two speeds, the faster supplying a very open time scale. Fast runs were made simultaneously on certain prearranged days at Bossekop and Potsdam. A comparison of the records showed the simultaneous, or practically simultaneous, occurrence on several occasions of small regular magnetic waves at the two stations. Similar previous comparisons by Eschenhagen and others have led to similar results, but the comparatively great distance—some 2000 kilometres—between the two stations in the present case makes the results of special interest.

Only a portion of the report mentioned in the foot-note is devoted to the work at Bossekop. A considerable part is occupied with the description of experiments with electric discharges in vacuum tubes, in which Prof. Birkeland has succeeded in producing phenomena having a close resemblance to some of the more prominent features of aurora. Reference is also made to work by Prof. J. J. Thomson and other recent investigators in vacuum-tube discharges. There is also a discussion of the bearing of the observations and experiments on Prof. Birkeland's theory of the cause of aurora and magnetic storms. This he believes to be electric currents in the upper atmosphere, the ultimate source of which he ascribes to cathode rays or other electrical emanations from the sun. The observations and experiments are illustrated in the text and in various plates at the end of the book.

This work is to be regarded only as introductory to a larger scheme in which Prof. Birkeland is about to embark, and in which he desires the cooperation of magnetic and meteorological observatories. The further scheme is described in two circulars which have recently been widely distributed.

The Norwegian Government is to maintain four stations in operation from August 1, 1902, to June 30, 1903. They are situated at Bossekop and in Iceland, Spitzbergen and Nova Zembla. At each of the stations there will be continuous photographic registration of the horizontal and vertical components of magnetic force and of the declination. The instruments are of the latest Eschenhagen pattern, similar to those supplied to the German and British Antarctic expeditions, with arrangements for running at ordinary or at rapid rates. Rapid runs are to be made on certain specified days and times, mainly during the 'term' hours on the 1st and 15th of each month, according to the scheme agreed on between the British and German Antarctic expeditions.

In addition there are to be rapid runs from 9 to 11 p.m., G.M.T., on December 2 to 8, 1902, January 2 to 8 and February 3 to 9, 1903. Prof. Birkeland is anxious that as many magnetic observatories as possible should participate in this scheme of rapid registration. He also asks for the cooperation of meteorologists in observing cirrus clouds, and especially in recording the direction of cirrus bands when such exist. This information is more particularly desired during the days of special magnetic observations referred to above. Prof. Birkeland thinks it probable that high cirrus may be influenced by the electric currents which he believes to exist in the upper atmosphere, and to which, as already stated, he ascribes a principal, if not an exclusive, part in the production of aurora and magnetic disturbances.

One of the principal objects of having four stations in Arctic regions is to obtain data from which calculations can be made as to the direction, altitude and intensity of atmospheric electric currents, if such exist. Prof. Birkeland hopes to obtain quantitative results sufficiently definite to put his theory to the test. The completeness of the test will, however, be much enhanced by the